APPROVAL SHEET FOR SUSPENDED LOAD OPERATIONS

SLO-KSC- 1995-002

TITLE REMOVAL/INSTALLATION OF THE 79K0987 TEST WEIGHT FROM/INTO THE 82K00804 STORAGE STAND OR LPIS AT SSPF

DOCUMENT NUMBER/TITLE OMI L5166, CARGO ELEMENT LIFTING ASSEMBLY (CELA) TPS-SS-SSPF-ACCESS-T0003 KT# MN870 PV MODULE/LONG SPACER DEMO TEST

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DATE 1 MARCH 1995

REQUIRED APPROVAL

CONTRACTOR	____ DESIGN	____ R & QA	X OPERATIONS	X SAFETY
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NASA SUSPENDED LOAD OPERATION
ANALYSIS/APPROVAL

OPERATION

1. To remove or install the 79K09857 test weight from or into the 82K00804 storage stand.

2. To remove or install the 79K09857 test weight from or into the Launch Package Integration Stand (LPIS).

3. To translate 79K09857 test weight in LPIS

These operations will be conducted one time only under this SLOAA report.

SUPPORTING DOCUMENTS - The associated operational procedure and System Assurance Analysis (SAA) are as follows:

- OMI L5166, Cargo Element Lifting Assembly (CELA)
- TPS-SS-SSPF-ACCESS-T003, RT# MN870 PV Module/long spacer demo test
- SAA21CRS1-001, 30 Ton Highbay Bridge Cranes - SSPF
- SAA21HASI-001, Cargo Element Lifting Assembly - SSPF

GENERAL DESCRIPTION

1. Removal or Installation of the 79K09857 test weight from or into the 82K00804 storage stand requires two persons to be partially under (hands only) the suspended CELA and a maximum of three people under the CELA Counterbalance Drive Motors to guide the trunnion from or into the corresponding trunnion retention fitting.

2. Removal or Installation of the 79K09857 test weight from or into the launch package integration stand (LPIS) requires two persons to be partially under (hands only) the suspended CELA and a maximum of three people under the

CELA Counterbalance Drive Motors to guide the trunnion from or into the corresponding trunnion retention fitting.

3. Translation of the 79K09857 test weight in the launch package integration stand (LPIS) requires a maximum of four people under the CELA to manually turn the bolts required to translate the weight during the test.

   - OMI L5166, Remove 79K09857 test weight from 82K00804 storage stand
   - OMI L5166, Install 79K09857 test weight into LPIS
   - TPS-SS-SSPF-ACCESS-T003, RT# MN870 translate 79K09857 test weight in LPIS using CELA.
   - OMI L5166, Remove 79K09857 test weight from LPIS
   - OMI L5166, Install 79K09857 test weight into 82K00804 storage stand

These tasks require personnel to be in the area of increased hazard directly under the suspended load for CELA operations. OMI L5166 is the controlling procedure used in the Operations and Checkout Building (O&C) for these operations but will temporarily be deviated to facilitate SSPF operations until a new OMI is written specifically for the SSPF.

RATIONALE/ANALYSIS - The suspended load tasks comply with the NASA Alternate Safety Standard as follows:

Alternate Standard Requirement #1a:

During installation and removal of the 79K09857 test weight into the LPIS or 82K00804 storage stand or translation of the test weight in the LPIS, the technician must be directly beneath the suspended load to guide the trunnions into/out of the retention fittings. There is no alternate access to the trunnion retention fittings located underneath the CELA Counterbalance Drive Motors. This physical limitation precludes any design, operational, or procedural changes that would eliminate personnel exposure to a suspended load.

Alternate Standard Requirement #1b - The possible use of a secondary support system, to catch the load in the event of a crane failure, was analyzed. It was

determined that the use of a secondary support system was not feasible because of positioning of the 79K09857 test weight over the 82K00804 storage stand or positioning of the 79K09857 test weight in the LPIS.

Alternate Standard Requirement #1c

- Two persons are allowed under (hands only) the suspended CELA and three persons are allowed under the CELA Counterbalance Drive Motors to guide the trunnions during installation or removal into or from the trunnion retention fittings of the LPIS or the 82k00804 storage stand.

- Four people are allowed under the CELA to translate the weight.

Alternate Standard Requirement #1d

- Guiding the 79K09857 test weight trunnions into or out of the retention fittings on the 82K00804 storage stand or the LPIS will take four persons (one per trunnion) and a task leader (five total) up to 60 minutes to ensure the payload is installed or removed properly. Two of these people have only their hands under the suspended load.

- Translating the 79K09857 test weight in the LPIS will take four persons up to 60 minutes to manually turn the bolts and translate the weight during the test.

Alternate Standard Requirement #4 - OMI L5166 permits only the approved number of persons under the suspended loads addressed in this analysis. The OMI is available on site for inspection during the operation.

Alternate Standard Requirement #6 - The suspended load operations addressed in this analysis involve one of the 30 ton SSPF bridge cranes. The cranes are designed, tested, inspected, maintained, and operated in accordance with the NASA Safety Standard for Lifting Devices and Equipment, NSS/GO-1740.9.

The 30 ton crane hoists are equipped with two magnetic holding brakes, each capable of holding the load up to the crane's rated capacity. Each brake's ability to hold the rated load (30 tons) is verified annually. The cranes are designed to meet a 5 to 1 safety factor based on ultimate strength for the hoist load bearing components.

The 30 ton cranes are load tested annually at 100% of their rated capacity. Detailed preventive maintenance is performed monthly, quarterly, semiannually, and annually on the cranes to ensure proper operation. A detailed inspection of the lifting slings is performed annually. Nondestructive testing of the slings and crane hooks is performed annually.

The weight of CELA and the 79K09857 test weight is 35,500 lbs, which is 60% of the crane's capacity. The lifting sling is rated at 36,500 lbs and is designed to meet a 5 to 1 safety factor based on ultimate strength.

Alternate Standard Requirement #7 - A System Assurance Analysis (SAA) has been completed on the 30 ton bridge cranes in the SSPF. The SAA includes a Failure Modes and Effects Analysis/Critical Items List (FMEA/CIL) and a hazard analysis (see supporting documents). No critical single failure points were identified during this analysis.

Alternate Standard Requirement #8 - Visual inspections for cracks or other signs of damage or anomalies are performed on the hoist hooks, hoist beams, hoist cables, hoist rod assemblies, and hoist fittings, and crane functional checks are performed before each operation per NSS/GO-1740.9.

Alternate Standard Requirement #9 - Trained and licensed crane operators shall remain at the hoist controls while personnel are under the load.

Alternate Standard Requirement #10 - Appropriate safety control areas are established before initiating operations. Only the minimum number of people (manloaded in the procedure) will be permitted in this area.

Alternate Standard Requirement #11 - A pretask briefing and a safety walkdown of the area are conducted prior to the lift to ensure that all systems and personnel are ready to support. All participants are instructed on their specific tasks and warned of any hazards involved. Following any crew change, the new personnel are instructed by the task leader on their specific tasks and warned of any hazards involved.

Alternate Standard Requirement #12 - Personnel beneath the suspended load will be in voice contact with the hoist operator and/or task leader. Upon loss of communication, the operation shall stop immediately, personnel shall clear the hazardous area, and the load shall be safed. Operations shall not continue until communications are restored.

Alternate Standard Requirement #13 - Personnel working beneath the load shall be in continuous sight of the hoist operator and/or task leader.

APPROVAL: **DATE:** 3/3/95

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